IN THE CLAIMS

Before page 1, line 1, insert the heading:
BACKGROUND AND SUMMARY

Starting at page 1, line 1, amend paragraphs as follows:

The invention pertains to an apparatus for writing an optical record carrier, ~~comprising~~including:

- a write unit for generating physically detectable patterns at the record carrier in response to a write signal which is modulated between at least a first and a second signal level, the write unit ~~comprising~~including a write head with a radiation source and an optical system for projecting a scanning spot at the record carrier, the write unit ~~comprising~~including a first detector for generating a first detection signal which is indicative for an intensity of the radiation source, and a second detector for generating a second detection signal which is indicative for an amount of radiation reflected by the record carrier, the write unit ~~comprising~~including a supply circuit for modulating the intensity of the radiation source between at least a first and a second value in response to the write signal,
- a control circuit for setting the first and the second value,
- displacement ~~means~~ apparatus for causing a relative displacement between the scanning spot and the record carrier.

From US 4 796 267 a laser controller is known which ~~comprises~~includes a negative feedback loop to control an average light quantity level despite variations in temperature. The feedback loop ~~comprises~~includes a sensor for generating an output signal which is a measure for the power of radiation of the radiation source, a low-pass filter for low pass filtering the output signal. The feedback loop further ~~comprises~~includes a subtractor for generating a difference signal which is a difference between said low-pass filtered signal and a setpoint signal

representing the desired average light quantity level. The known circuit maintains the average light quantity level when the temperature changes. However, if the temperature changes also the proportionality factor between the control current and the light quantity level of the semiconductor radiation source changes. This implies that the difference between the output levels of the radiation source changes with a changing temperature.

Also control circuits are known which include a feedback ~~means~~ unit which monitor the respective power of the radiation for each modulation level and adapts the control current accordingly. This has the disadvantage that the feedback ~~means~~ unit require a large bandwidth.

It is a purpose of the invention to provide an apparatus for writing a record carrier which is capable of maintaining a plurality of intensity levels at a predetermined value, using a feedback loop with a relatively low bandwidth. According to the invention ~~the apparatus of the above described kind is characterized in that~~ the control circuit ~~comprises~~includes a first feedback loop for generating a first control signal, which feedback loop includes the first detector, the control circuit ~~comprises~~includes a second feedback loop for generating a second control signal, the second feedback loop including the second detector and a unit for generating a ratio signal which is representative for the ratio between the amount of reflected radiation when the write signal assumes the first signal level and when it assumes the second signal level, the control circuit further ~~comprising~~including a signal combination unit for generating the second control signal, this signal being indicative for the product of the ratio signal and the first control signal.

In the apparatus according to the invention one of the levels is controlled by the first feedback loop which ~~comprises~~includes the first detector. For this purpose a relatively slow feedback loop suffices. The ratio of the different levels is controlled by

means of a the second feedback loop which uses the second detector for generating the second detection signal which is indicative for an amount of radiation reflected by the record carrier. Usually an apparatus for writing a record carrier is also suitable for reading a record carrier. Such an apparatus will already comprise a detector for measuring an amount of reflected radiation. In the device according to the invention a reliable control of the power of the radiation source is obtained by combining the output signals of the first and the second detector.

Starting at page 2, line 27, amend the paragraph as follows:

The ~~means~~ apparatus for causing a relative displacement between the scanning spot and the record carrier ~~comprise~~includes in the present embodiment a motor for rotating the record carrier, and ~~means~~ apparatus for radially displacing a read head. The ~~means~~ apparatus for radially displacing the head may e.g. ~~comprise~~includes a slide or a swing arm. In addition ~~said means~~the head displacing apparatus may ~~comprise~~include fine displacement ~~means~~apparatus, for example an actuator for displacing the scanning spot with respect to the head, for example by moving an optical element in the head, such as a mirror or a lens. In another embodiment the record carrier is a card. In that embodiment the head and the record carrier may be movable with respect to each other in mutually orthogonal directions, for example by linear motors.

Before page 3, line 5, insert the heading:
BRIEF DESCRIPTION OF THE DRAWINGS

Before page 3, line 16, insert the heading:
DETAILED DESCRIPTION

Starting at page 3, line 16, amend the paragraphs as follows:

Figure 1 schematically shows an apparatus for writing an optical record carrier 10. The apparatus shown therein ~~comprises~~includes a write unit 20 for generating physically detectable patterns at the record carrier 10 in response to a write signal Sw which is modulated between at least a first and a second signal level. The write signal Sw is generated from an information signal Sinf by a chain of processing units ~~comprising~~including a first unit for applying an error-correction code (e.g.CIRC) to the information signal Sinf. The signal so obtained is applied to a channel encoding unit 51 (e.g. EFM or EFM+). The output signal of the channel encoder 51 is provided to a write strategy generator 52, which on its turn provides the write signal Sw.

The write unit 20 ~~comprises~~includes a write head 21 with a radiation source 22, such as a semiconductor laser and an optical system 23 for projecting a scanning spot 24 at the record carrier 10. As schematically shown the optical system 23 ~~comprises~~includes beam splitting element 23a, and a focussing lens 23b, but various other implementations are possible. The write unit 20 further ~~comprises~~includes a first detector 25 for generating a first detection signal Sd1 which is indicative for an intensity of the radiation source 22. The first detector 25 receives a portion of the radiation emitted by the radiation source via a partial reflecting element 23c. The write unit 20 further ~~comprises~~includes a second detector 26 for generating a second detection signal Sd2 which is indicative for an amount of radiation reflected by the record carrier 10. The second detector generates the second detection signal Sd2 in response to radiation which is reflected from the record carrier 10 via the beam splitting element 23a.

The write unit 20 further ~~comprises~~includes a supply circuit 27 for modulating the intensity of the radiation source 22 between at least a first and a second value in response to the write signal Sw.

The apparatus further ~~comprises~~includes a control circuit 30 for setting the first and the second value.

The apparatus shown ~~comprises~~includes displacement ~~means~~ apparatus 40, 41 for causing a relative displacement between the scanning spot 24 and the record carrier 10. In the embodiment shown the displacement ~~means comprise~~ apparatus includes a spindle motor 40 for rotating the record carrier 10 and a slide motor 41 for sliding the write head 21 in a radial direction. The write head 21 also ~~comprises~~includes a radial actuator (not shown) for precisely displacing the scanning spot over small distances. e.g. by radially moving the lens 23b and an axial actuator (not shown) for adjusting the focus of the scanning spot 24, e.g. by axially moving the lens 23b.

In the ~~The~~ apparatus ~~is characterized in that~~ the control circuit 30 ~~comprises~~includes a first feedback loop 25, 31,32, 33 for generating a first control signal Sc1. The first feedback loop includes the first detector 25. The output signal Sd of the detector is sent via signal processing unit 31 to a comparison unit 32. The latter unit 32 compares the output signal of the signal processing unit 31 with a set point generated by setpoint generator 33. The output of the comparison unit 32 serves as the first control signal. The control circuit 30 further ~~comprises~~includes a second feedback loop 25, 35, 36 for generating the second control signal Sc2. The second feedback loop includes the second detector 25, and a unit 35 for generating a ratio signal Sr which is representative for the ratio between the amount of reflected radiation when the write signal assumes the first signal level and when it assumes the second signal level. The control circuit 30 further ~~comprising~~including a signal combination unit 36 in the second loop for generating the second control signal Sc2. This signal is indicative for the product of the ratio signal Sr and the first control signal Sc1.

As shown in Figure 2, the signal processing unit 31 of the first feedback loop includes a current to voltage converter 310 for converting the first detection signal from a current signal into a voltage signal. The signal processing unit also ~~comprises~~includes a sample and hold unit 311 for sampling the, converted, first detection signal Sd1. The sample and hold unit 311 is coupled to a sample signal generator 312 which generates a sample signal at a moment that a portion of the record carrier 10 is erased. As the erase level is maintained during a substantially longer time interval said level can be accurately sampled despite the slow response of the first detector 25.

Starting at page 5, line 3, amend the paragraph as follows:

Also it can be seen in Figure 2 that the unit 35 for generating a ratio signal Sr ~~comprises~~includes a sample and hold unit 351 for sampling the second detection signal Sd2 and generating a first auxiliary signal S1. The sample and hold unit 351 is coupled to a sample signal generator 312 which generates a sample signal at a moment that a portion of the record carrier is to be erased. In this embodiment the first and the second feedback loop share the sample generator 312 shown in Figure 2. The unit 35 further ~~comprises~~includes a peak detector 352 for generating a second auxiliary signal S2. The peak detector 352 and the sample and hold unit 351 are coupled to a signal combination device 353 for generating the ratio signal Sr from the first S1 and the second auxiliary signal S2. The sample and hold unit 351 and the peak detector 352 receive the second detection signal via a signal processing unit 350, which may for example include current to voltage conversion ~~means~~unit.

In the embodiment shown in Figure 3 the second detector 26 ~~comprises~~includes a plurality of detection elements 26a, ..., 26d.

Starting at page 7, line 18, amend the paragraph as follows:

It is remarked that the scope of protection of the invention is not restricted to the embodiments described herein. Neither is the scope of protection of the invention restricted by the reference numerals in the claims. The word '~~comprising~~including' does not exclude other parts than those mentioned in a claim. The word 'a(n)' preceding an element does not exclude a plurality of those elements. ~~Means~~ Apparatus forming ~~part~~ various portions of the invention may both be implemented in the form of dedicated hardware or in the form of a programmed general purpose processor. The invention resides in each new feature or combination of features.